Development of a Thin Gauge Metallic Seal for Gas Turbine Engine Applications to 1700°F

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Reprint from
NASA/CP—98-208527, Seals/Secondary Flows Workshop 1997
a conference held at
Cleveland, Ohio, October 16-17, 1997

DEVELOPMENT OF A THIN GAUGE METALLIC SEAL FOR GAS TURBINE ENGINE APPLICATIONS TO 1700°F

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The goal of doubling thrust-to-weight ratio for gas turbine engines has placed significant demands on engine component materials. Operating temperatures for static seals in the transition duct and turbine sections, for instance, may well reach 2000°F within the next ten years. At these temperatures conventional age-hardenable superalloys loose their high strength via overaging and eventual dissolution of the γ' precipitate, and are well above their oxidation stability limit Conventional solid-solution-strengthened alloys offer metallurgical stability, but suffer from rapid oxidation and little useful load bearing strength. Ceramic materials can theoretically be used at these temperatures, but manufacturing processes are in the developmental stages.

The development of a thin gauge metallic seal for operating temperatures up-to 1700°F is presented. The results of stress relaxation and oxidation screening tests for seven candidate alloys in strip form are discussed. Component tests using static loading in a seal chamber fixture correlate well with the stress relaxation and oxidation tests, and indicate that seals made from a new iron-based superalloy offer superior resistance to oxidation, metallurgical stability, and significant residual sealing force up to 672 h continuous exposure at 1700°F.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No 0704-0188

1. AGENCY USE ONLY (*Leave blank*)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	October 1998	Conference Publication

4. TITLE AND SUBTITLE

Seals/Secondary Flows Workshop 1997
Volume 1

5. FUNDING NUMBERS

WU–910–30–11–00

6. AUTHOR(S)

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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

National Aeronautics and Space Administration
Lewis Research Center
Cleveland, Ohio 44135–3191

8. PERFORMING ORGANIZATION REPORT NUMBER

E–11301

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

National Aeronautics and Space Administration
Washington, DC 20546–0001

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

NASA CP—1998-208527

11. SUPPLEMENTARY NOTES

Responsible person, Robert C. Hendricks, organization code 5000, (216) 977–7507.

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Restricted Distribution Notice
Available Only with Approval of Issuing Office: R&T Directorate,
Lewis Research Center, Cleveland, OH 44135

Subject Categories: 07, 20, and 34 Distribution: Local

12b. DISTRIBUTION CODE

13. ABSTRACT ***(Maximum 200 words)***

This workshop has six categories. (1) In the opening sessions we are attempting to provide an overview of the engine technology, applications, and perceived needs from the programmatic point of view. (2) In the second session more details of seals and secondary flows are presented. (3) In the third session some of the tools and techniques are examined. (4) In the fourth session engine externals, the region between the case and the nacelle are examined in more detail. (5) Some sealing needs as applied to High Speed Research (HSR) are presented in a limited exclusive rights session. (6) A short course on engine design development margins by Charles Bentz rounds out the workshop. Through these sessions the efforts at NASA LeRC, contractors and universities are applied to seals/secondary flow problems in a continued effort to expand the U.S. aerospace technology and marketshare. A second volume containing related HSR discussions is available to selected U.S. citizens.

14. SUBJECT TERMS

Seals; Rotordynamics; Components cooling; Secondary air flows; Aeroderivative; Overview; Modeling; Codes; Monitoring

15. NUMBER OF PAGES

509

16. PRICE CODE

A22

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	

NSN 7540-01-280-5500

Standard Form 298 (Rev 2-89)
Prescribed by ANSI Std Z39-18
298-102